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Dean

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(54) **DUST-FREE SEALER FOR VALVE BAGS**

(76) Inventor: **James Dean**, 20323 Quincy Ct., Humble, TX (US) 77338

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Related U.S. Application Data

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(51) **Int. Cl.**
B32B 3/00 (2006.01)

(52) **U.S. Cl.** **428/40.1**; 428/41.7; 428/41.9; 428/43; 428/192; 428/194; 428/200; 428/201; 428/202

(58) **Field of Classification Search** 428/40.1, 428/41.9, 43, 192, 194, 41.7, 200, 201, 202
See application file for complete search history.

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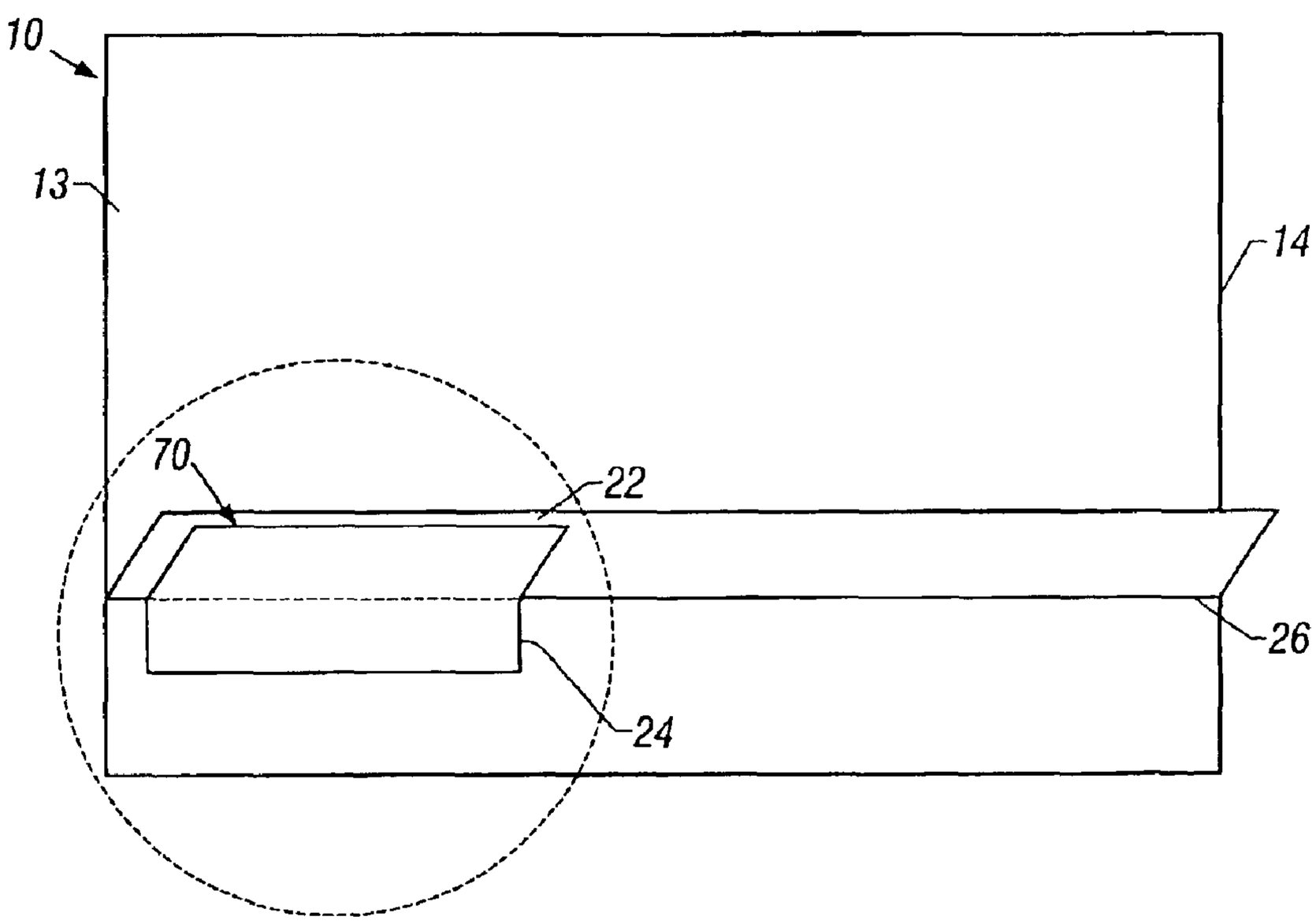
(57) **ABSTRACT**

The invention provides for a sealing device for a valve bag. The sealing device has two sections separated by a perforated seam. Each section is secured to one side of the valve channel and has an adhesive surface covered by a protective sheet. The two sections are perforated by the filling tube when the valve bag is filled, once the valve bag is filled the protective sheet is cleaned and removed and the two sections of the sealing device are pressed together and secured by the interaction of their adhesive surfaces.

12 Claims, 9 Drawing Sheets



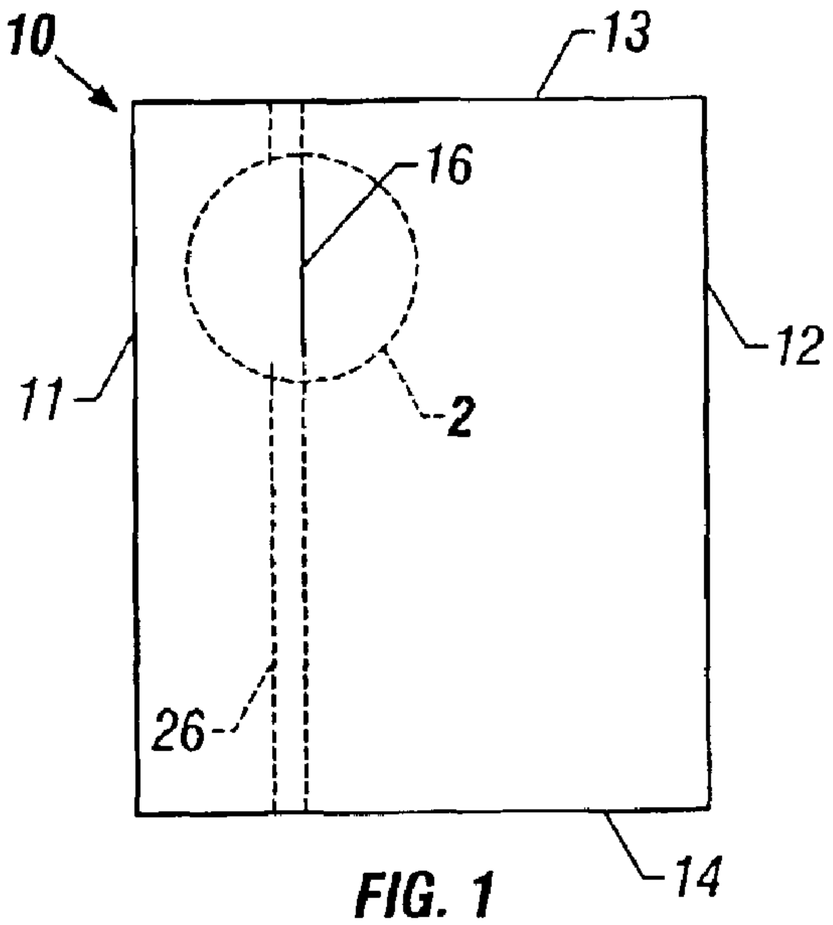


FIG. 1

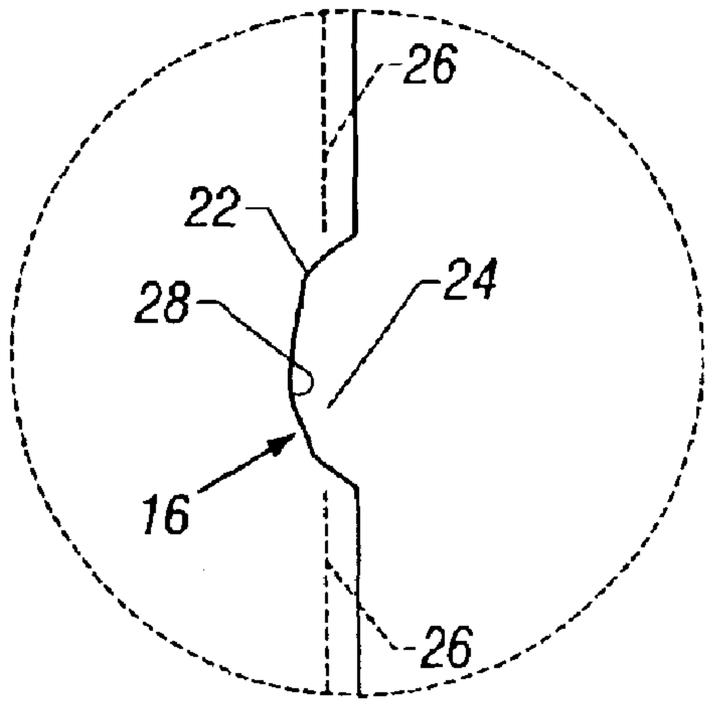


FIG. 2

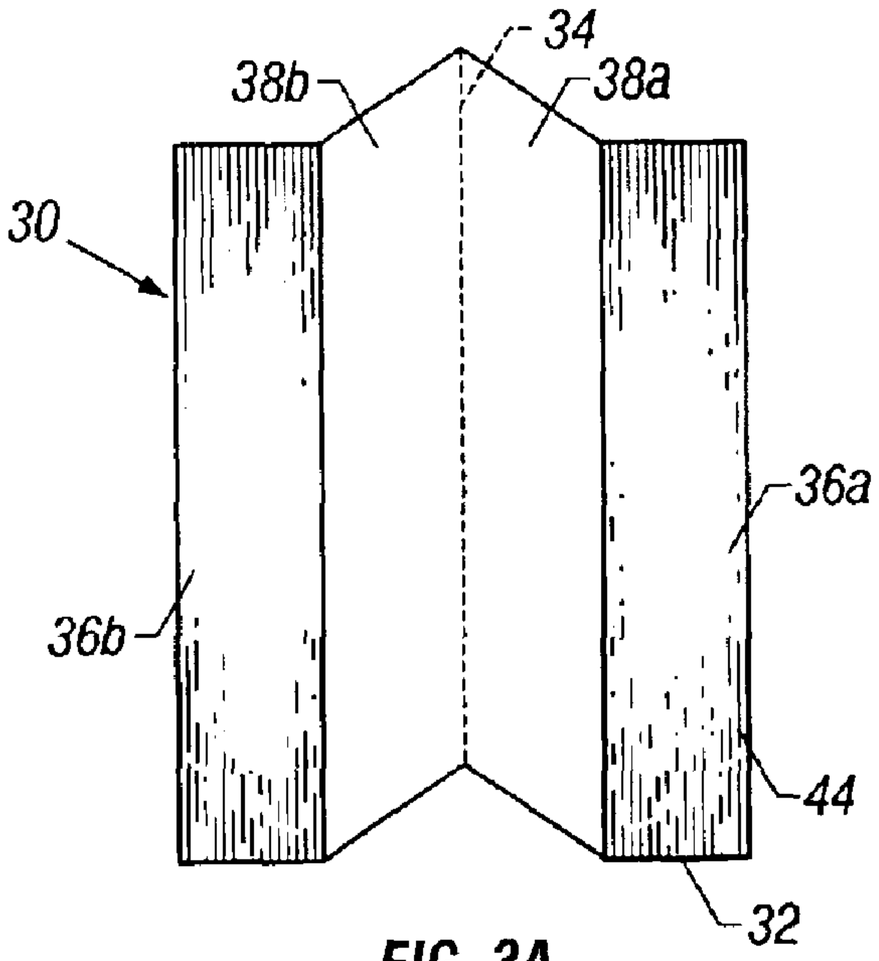


FIG. 3A

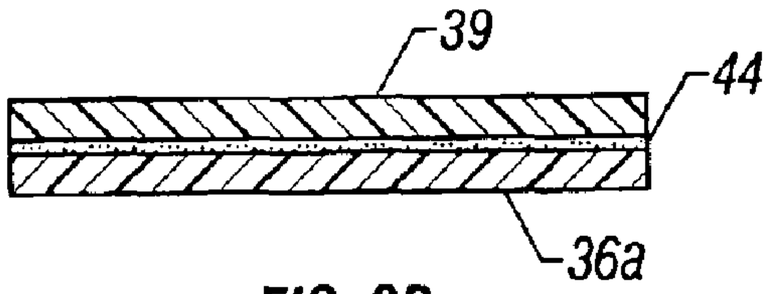


FIG. 3B

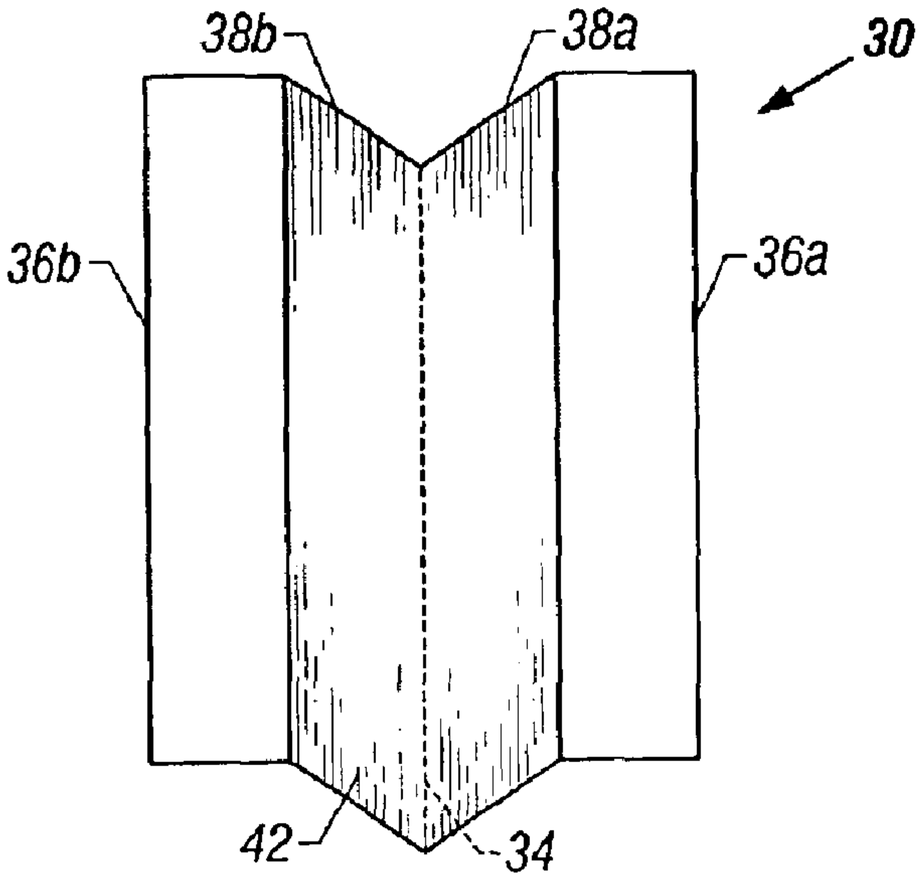


FIG. 4A

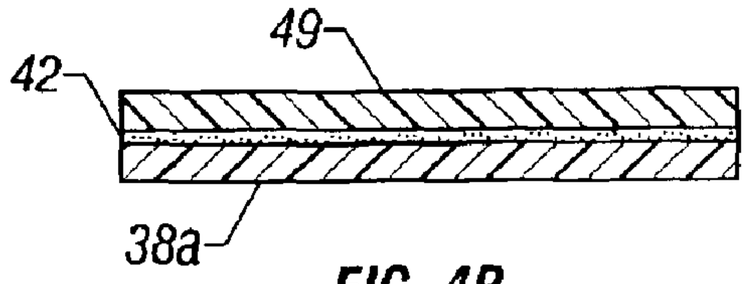


FIG. 4B

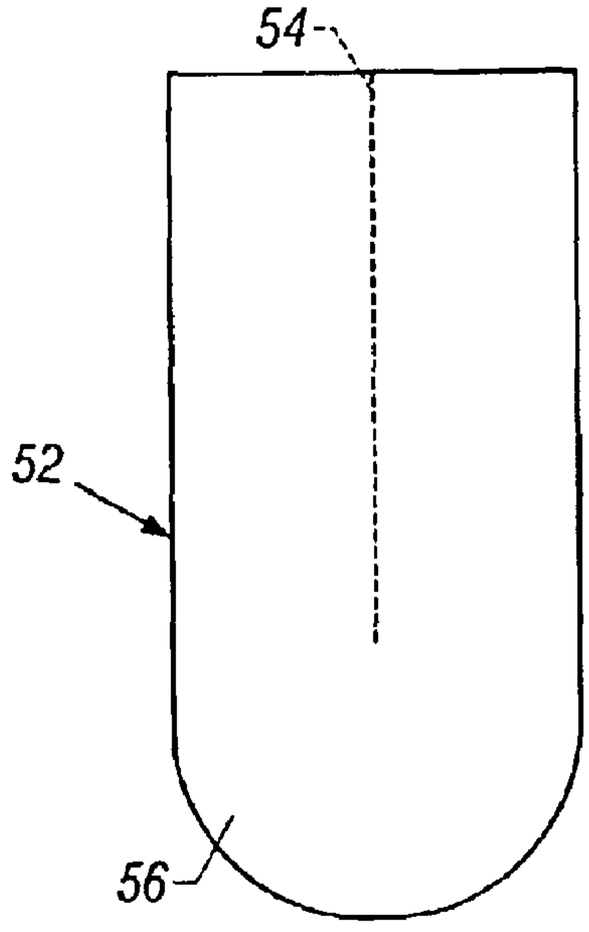


FIG. 5

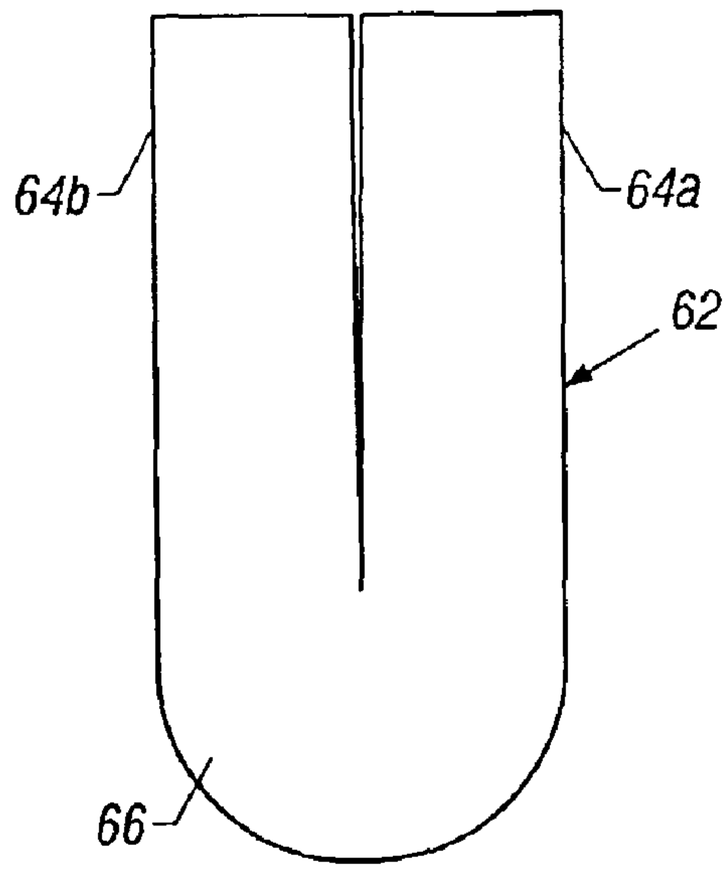


FIG. 6

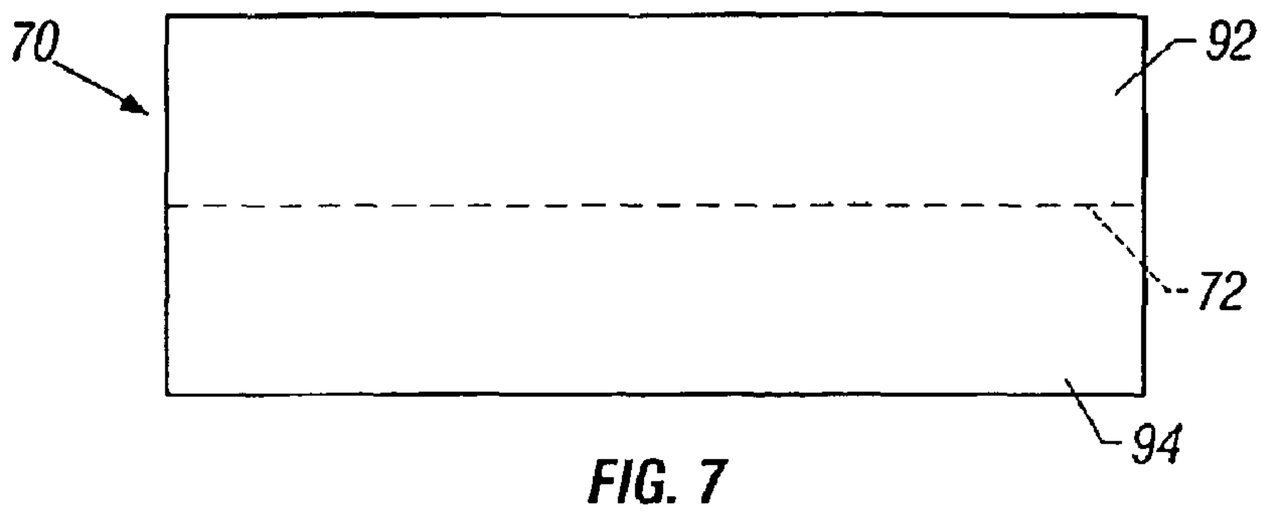


FIG. 7

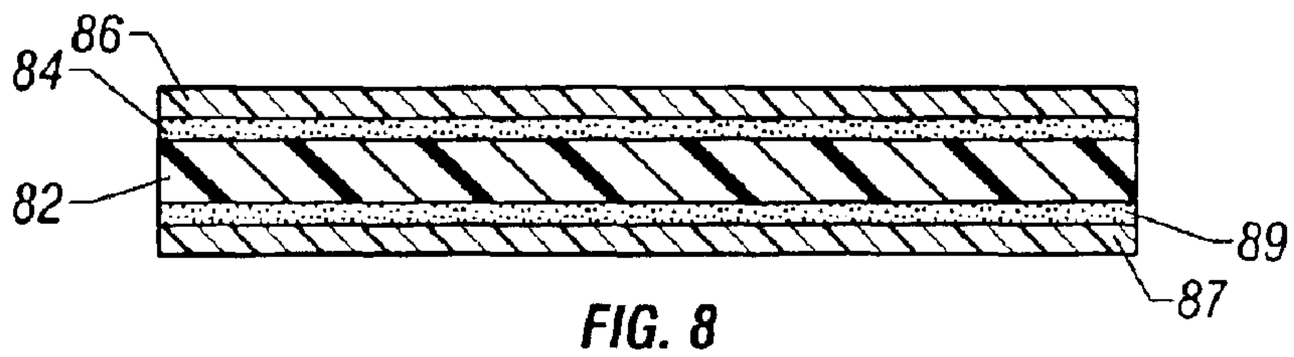


FIG. 8

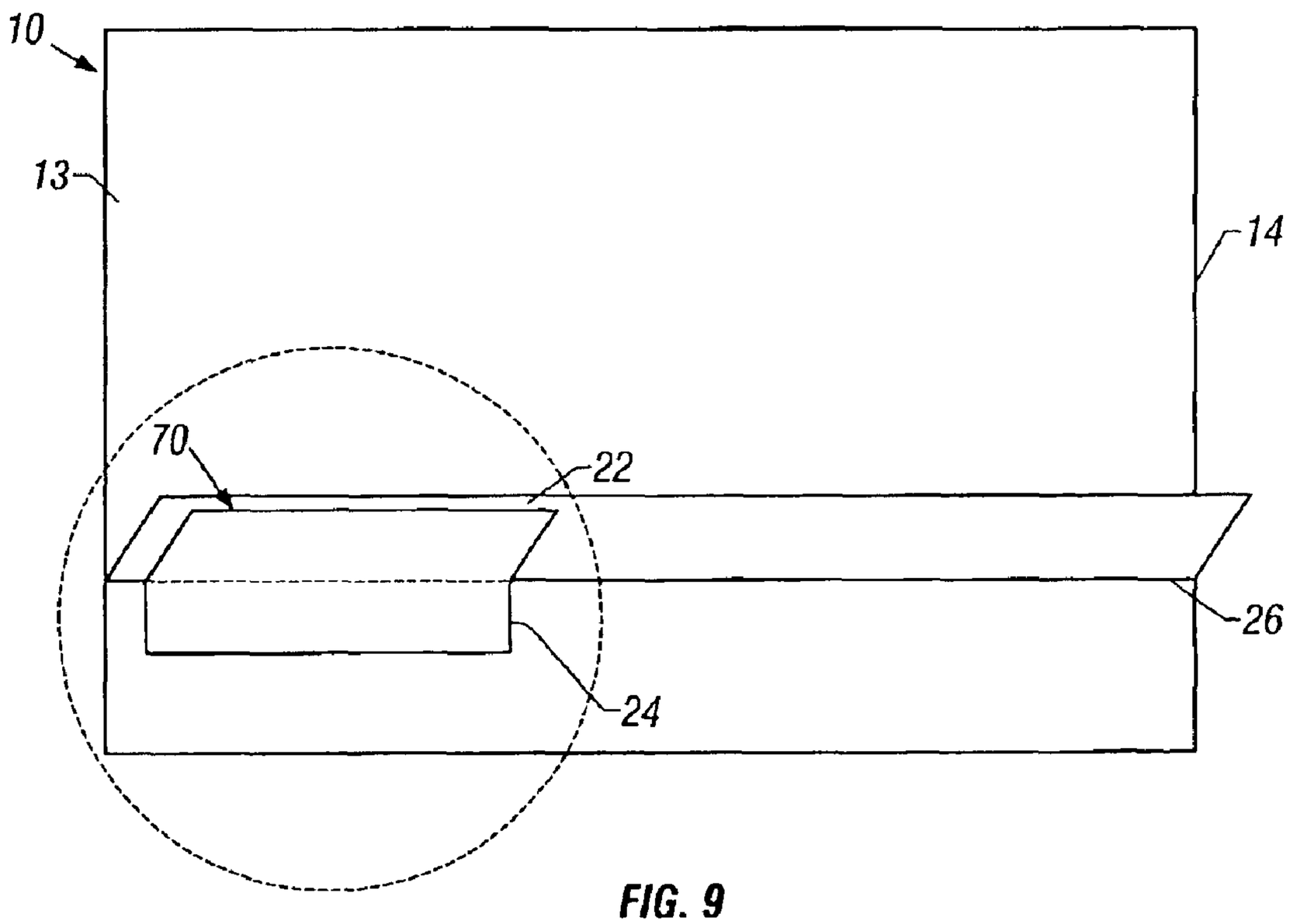


FIG. 9

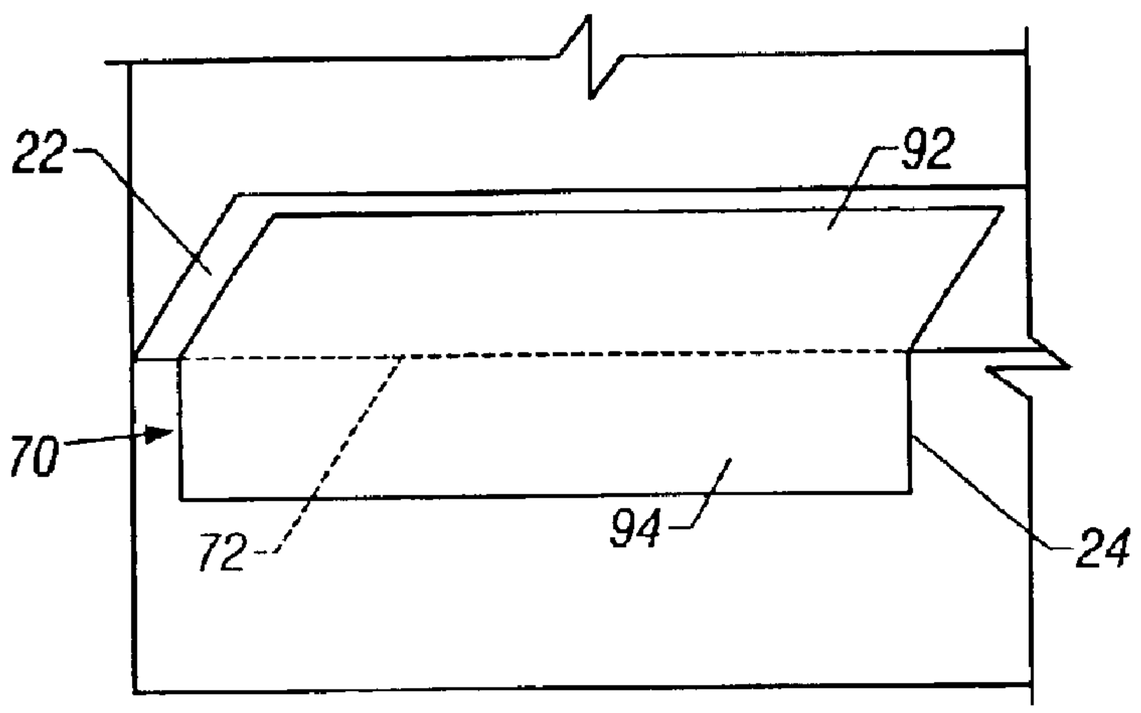


FIG. 10

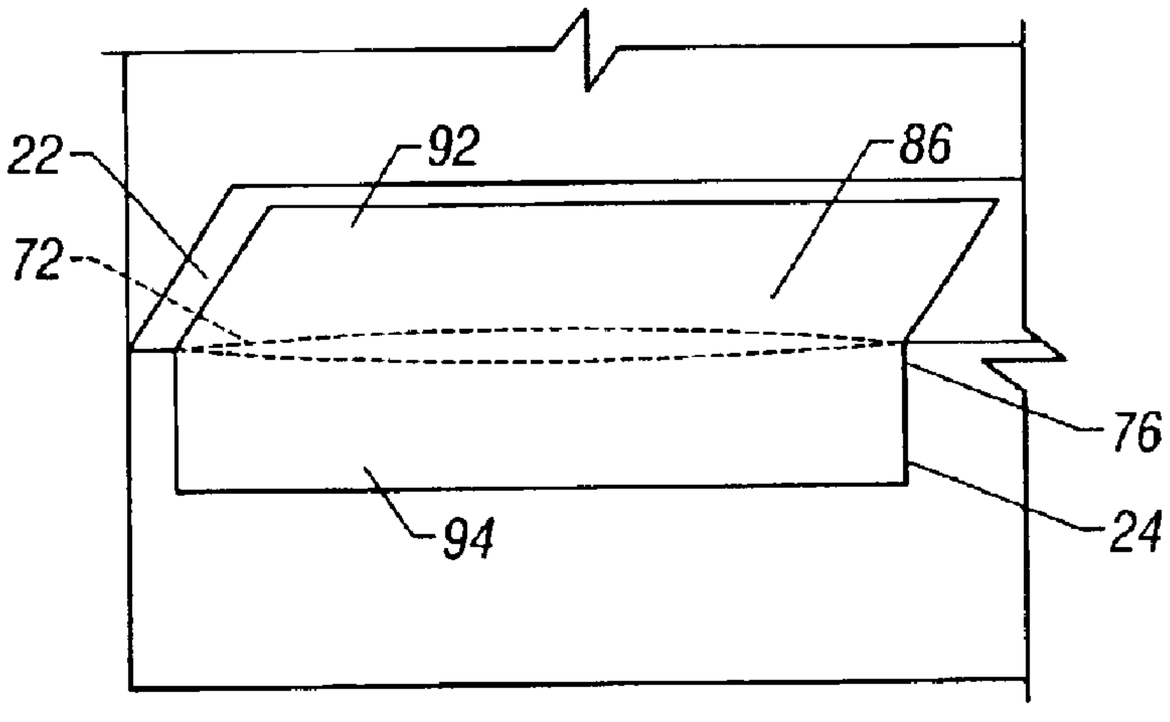


FIG. 11

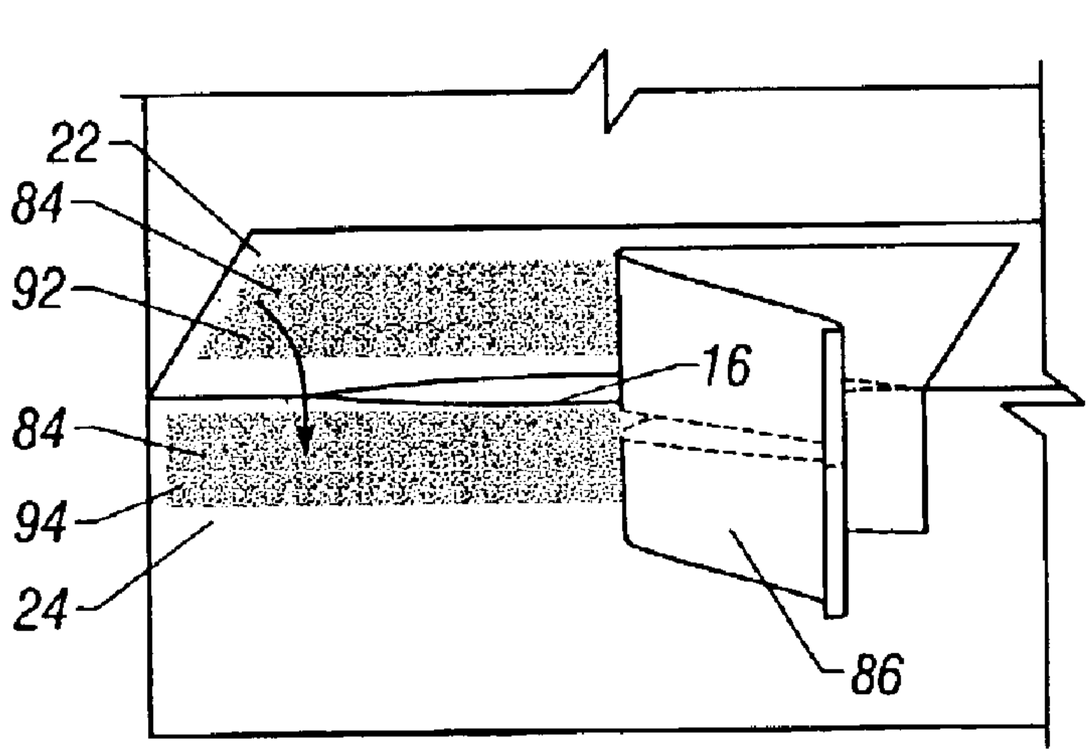


FIG. 12

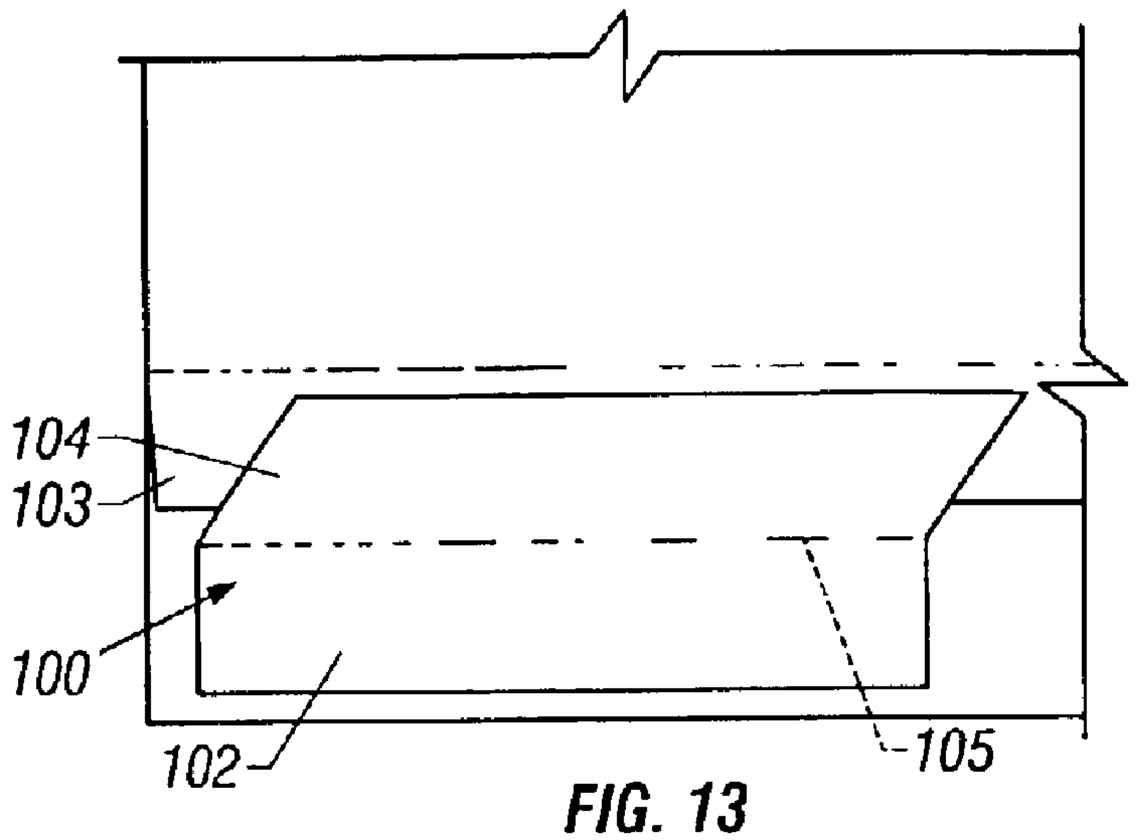


FIG. 13

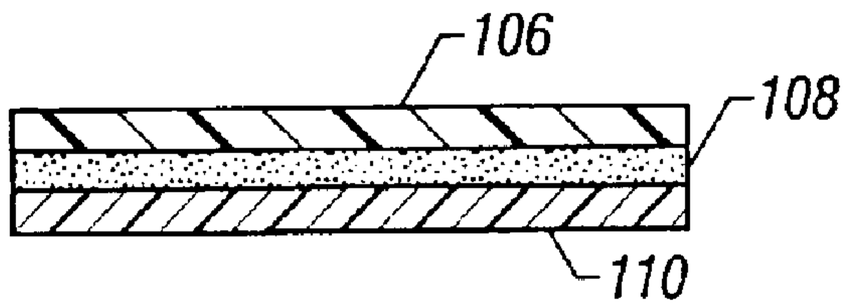


FIG. 14

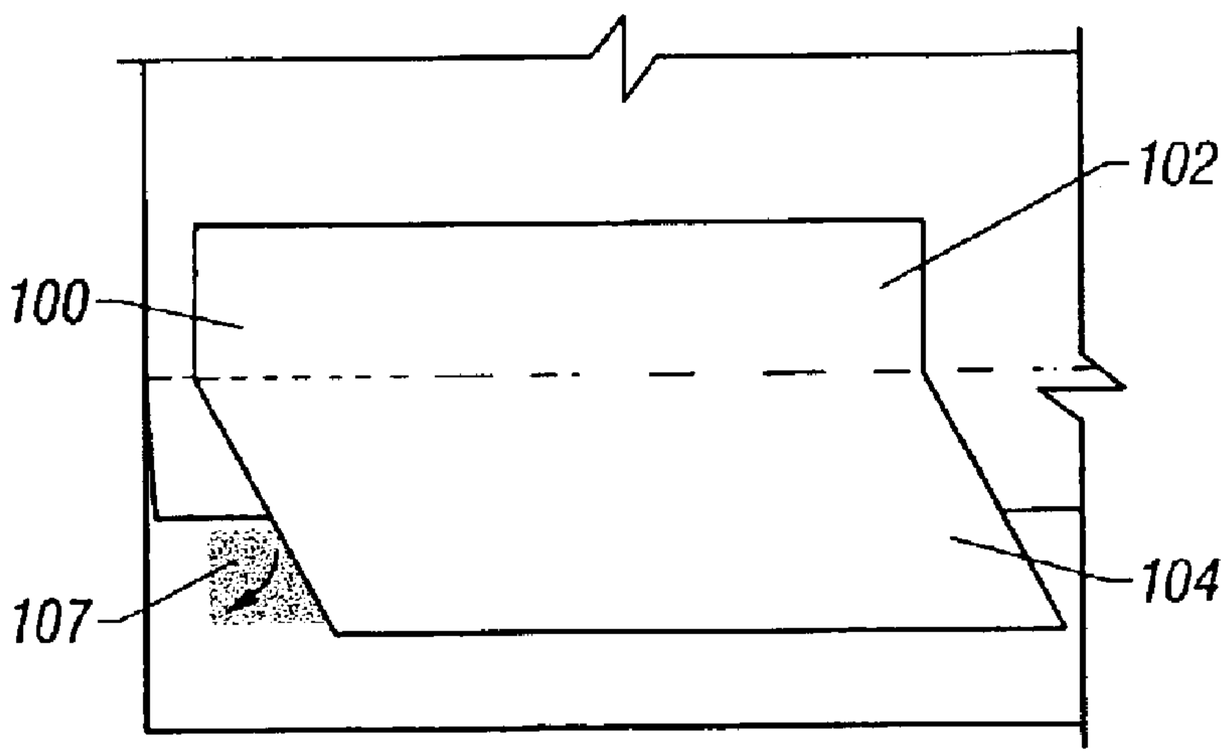


FIG. 15

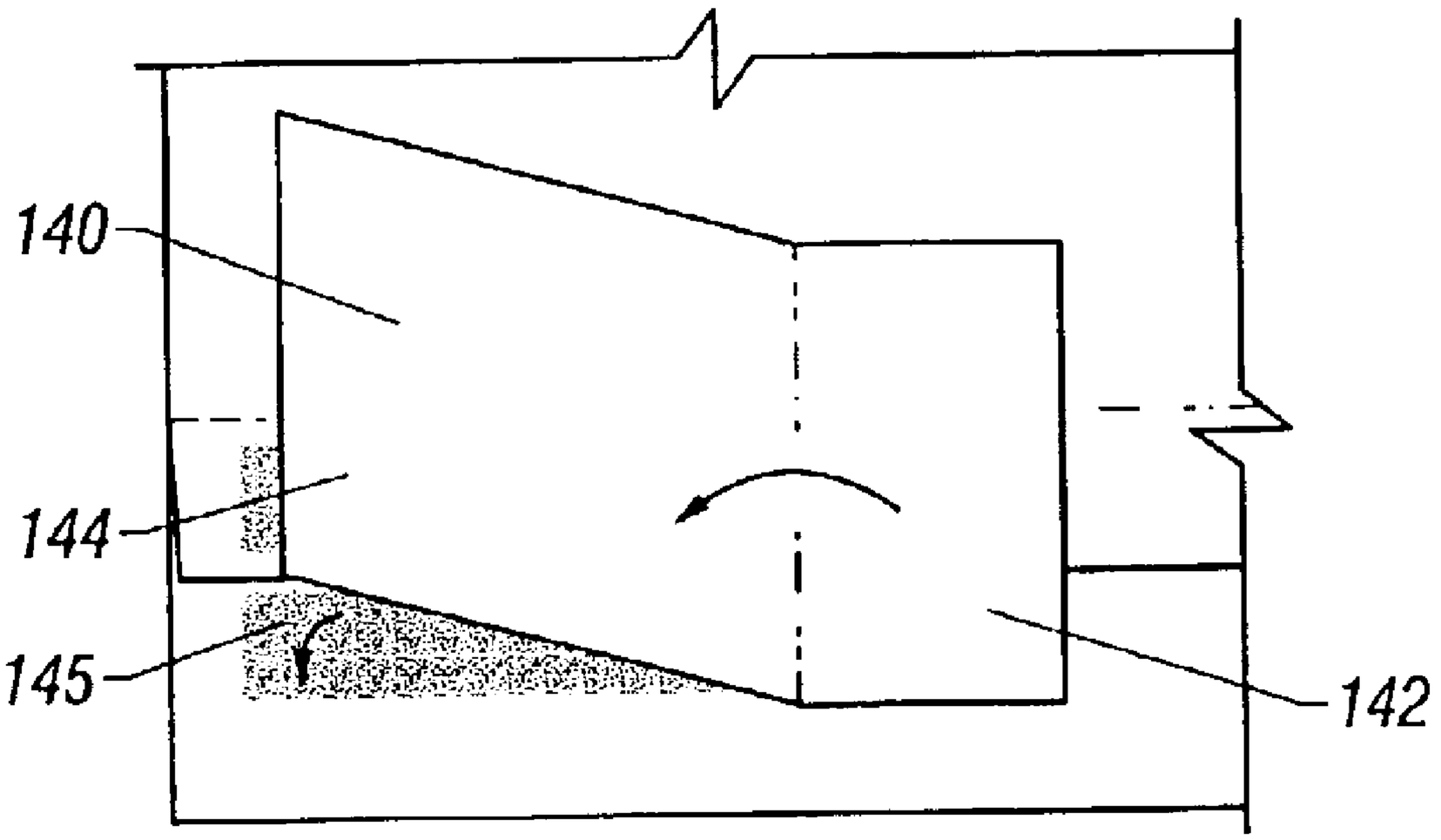


FIG. 16

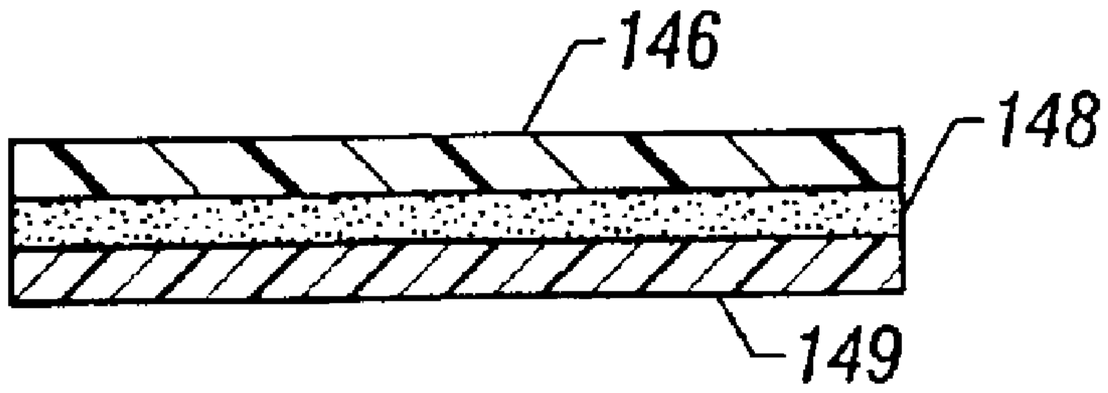


FIG. 17

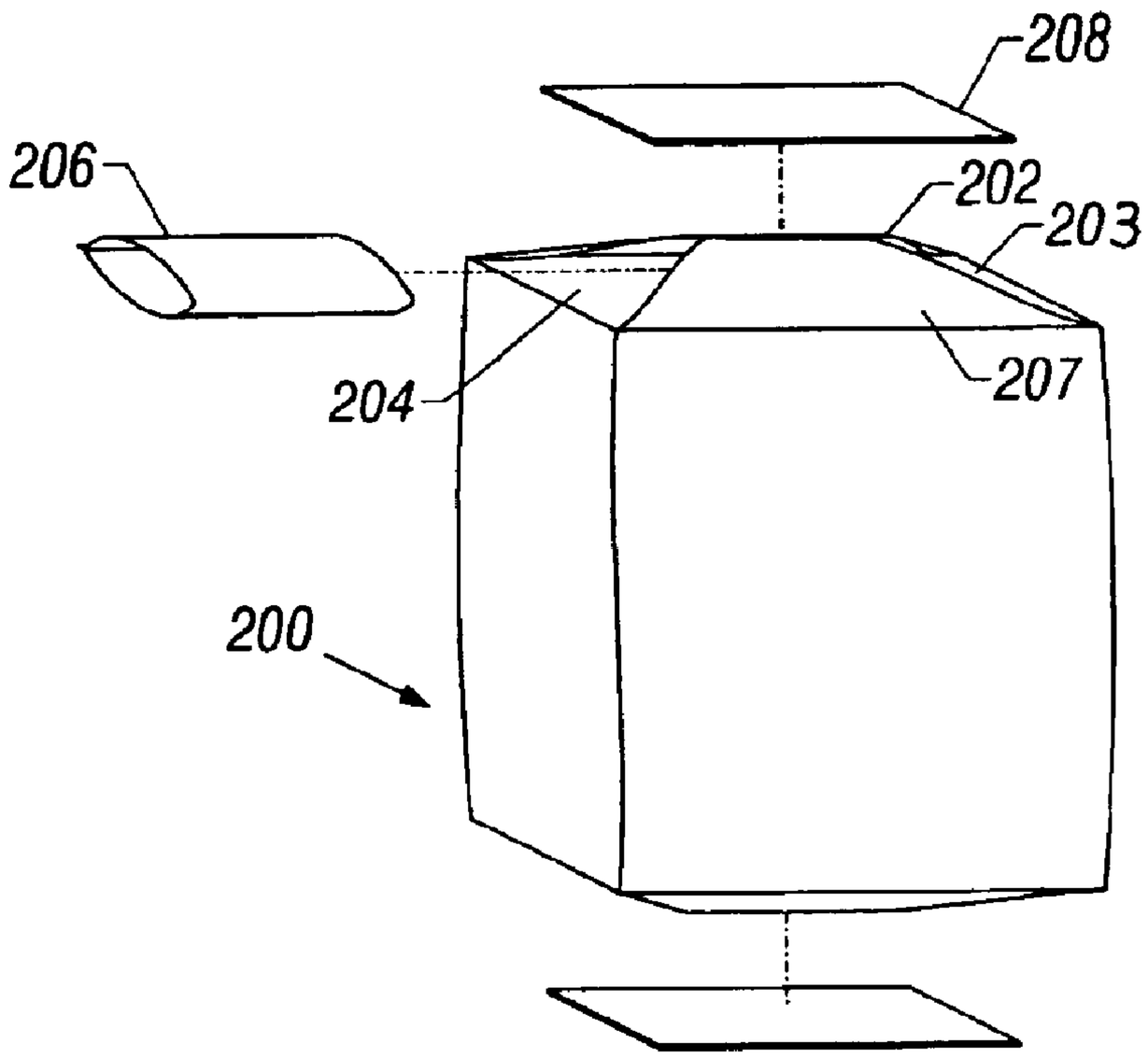


FIG. 18

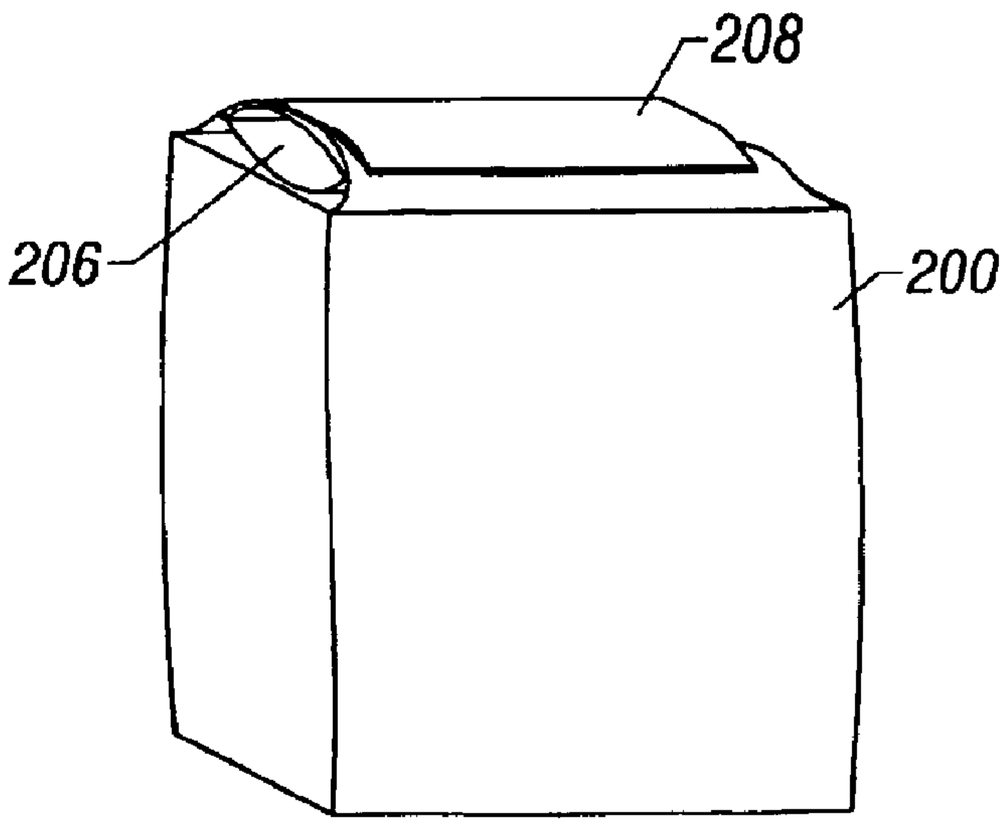


FIG. 19

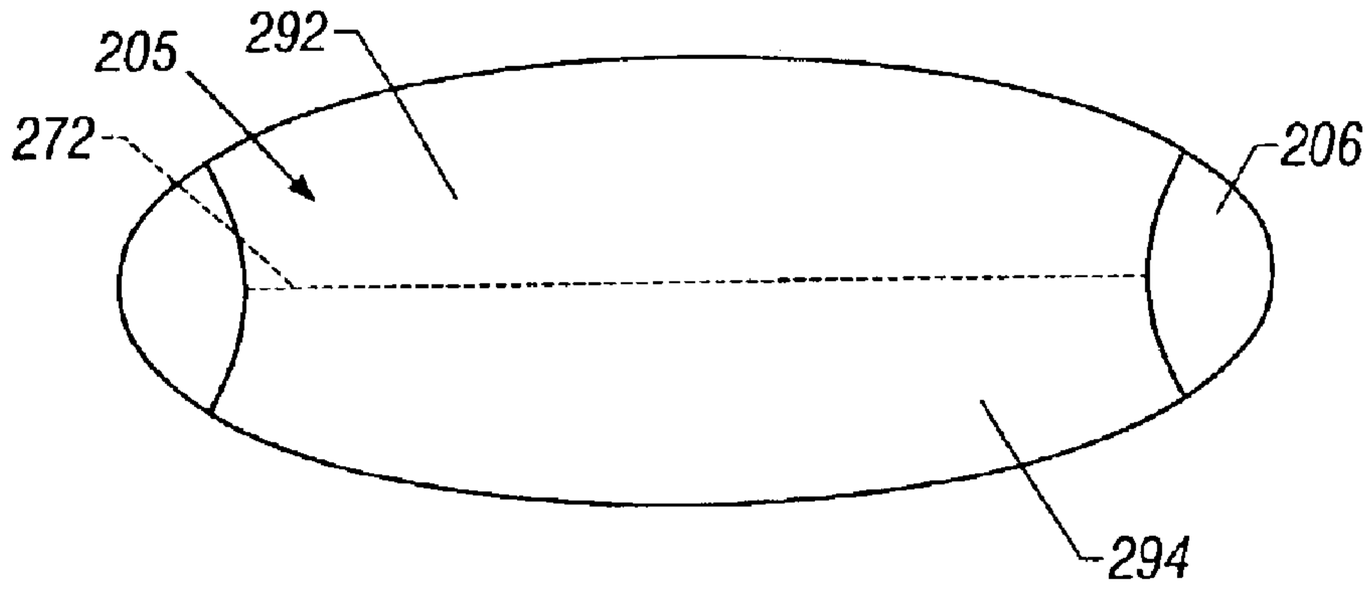


FIG. 20

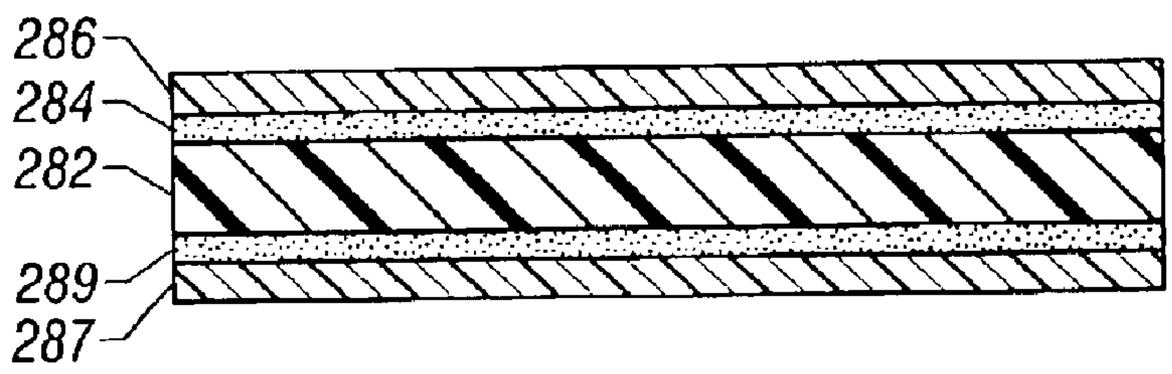


FIG. 21

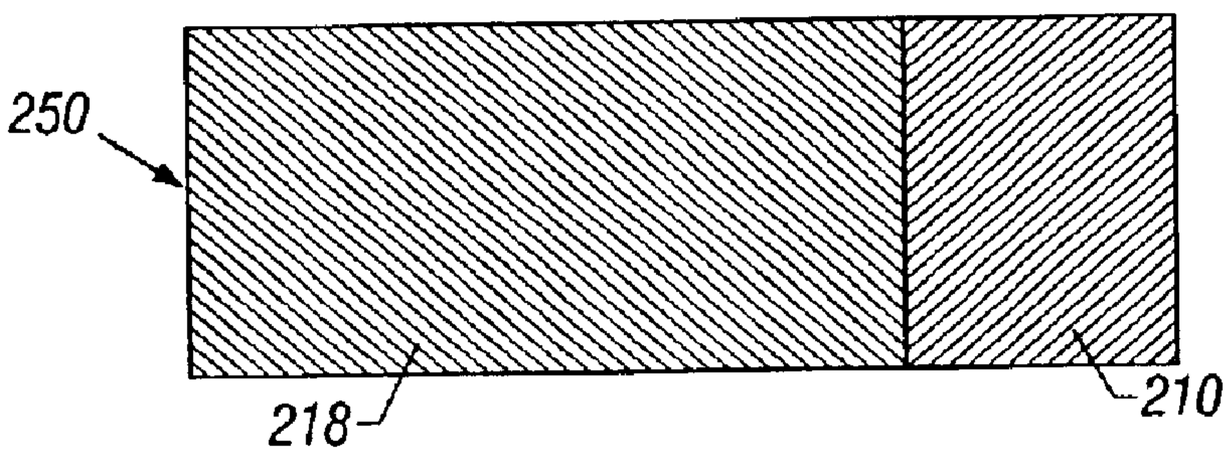


FIG. 22

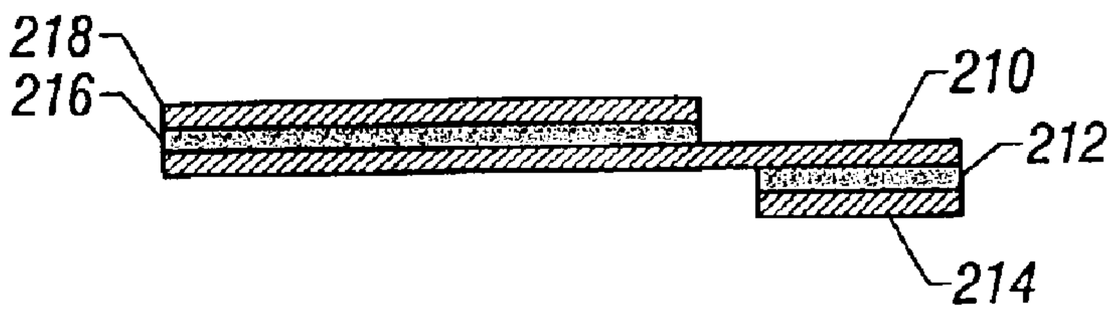


FIG. 23

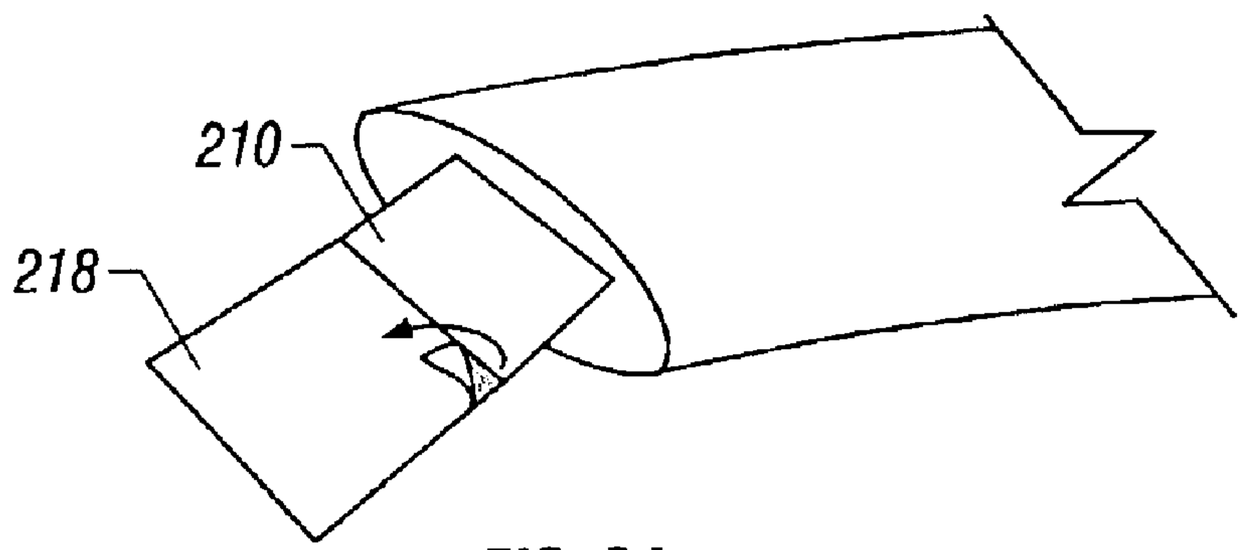


FIG. 24

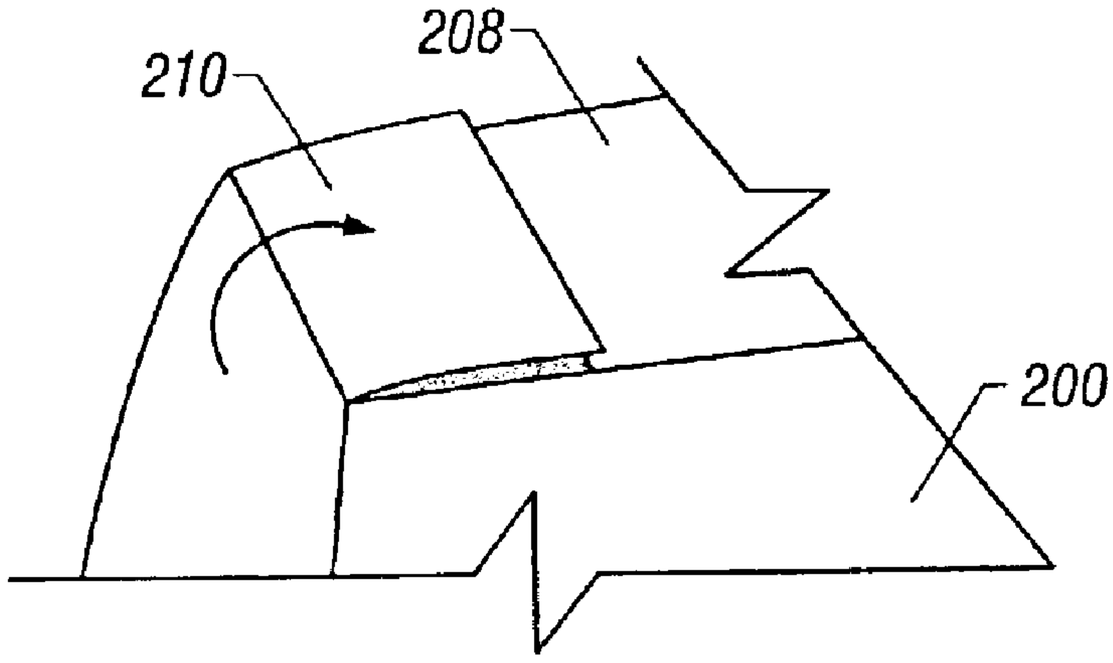


FIG. 25

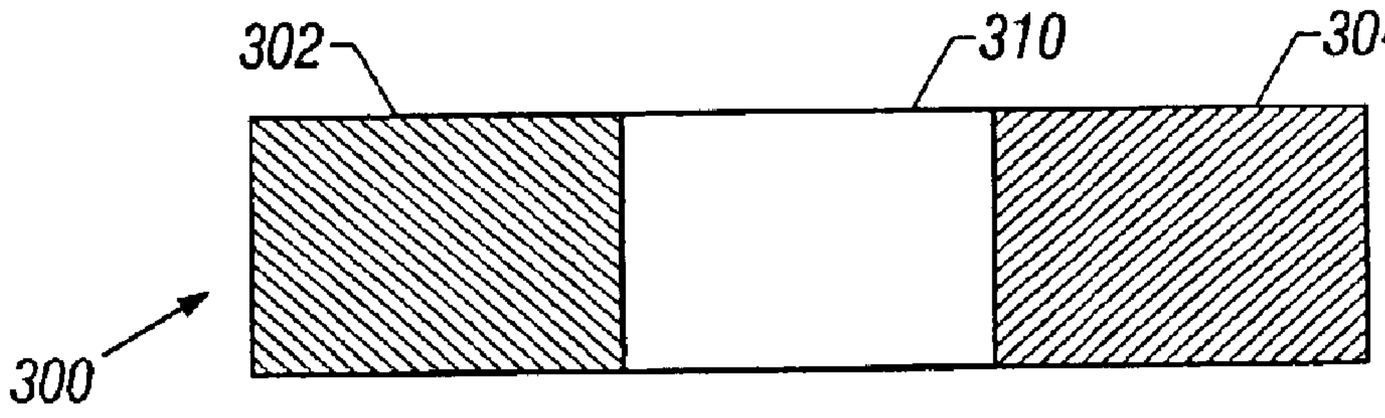


FIG. 26

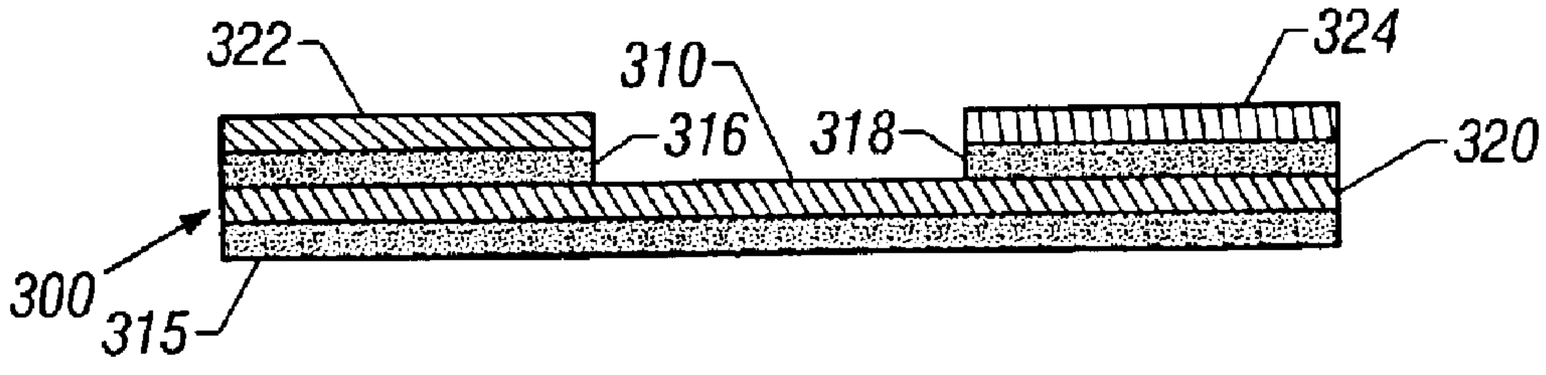


FIG. 27

DUST-FREE SEALER FOR VALVE BAGS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority to the following patent application: pending U.S. patent application Ser. No. 60/371,870 filed Apr. 11, 2002 by inventor James Dean and entitled "Dust-free Sealer for Valve Bags."

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to valve bags and, more specifically to a mechanism for sealing a valve bag used to contain and transport fine granular products (e.g., rice hull ash) to prevent loss of the products from the valve bag during the handling and shipping of filled valve bags.

2. Description of the Related Art

Plastic valve bags are multi-walled sacks made of a flexible plastic material. Typically, valve bags are formed by cutting and overlapping each layer of plastic along its length. The overlapping region on the long side of the bag is heat sealed, as well as the short sides or ends; provided that a portion of the long side is left unsealed close to one end of the bag to provide a fill hole or valve channel. Alternatively, the valve channel may be configured along the short side of the bag.

Valve bags are filled through a filling tube inserted into the valve channel. Once the valve bag is filled, the bag is upended so that the weight of the filling material closes the valve channel. However, some of the filling material escapes through the unsealed valve channel whenever the valve sack is being handled. For example, the filling material will seep out of the unsealed valve channel during transport so that the filling material is deposited between the layers of bags in a container. When the consumer seeks to remove the filled valve bags from the shipping container, the loose filling material gets into workers' eyes generating a source of eye irritation. To prevent worker health problems and lost time due to eye irritation, a number of attempts have been made to find a suitable sealing mechanism for valve bags to prevent the sieving or leakage of the bag contents back through the valve channel after filling. Typically, these mechanisms have included coating the inner surfaces of the overlapping valve channel with an adhesive or other sealing material, which may be activated by heat or ultrasonic means. Recently, attempts have been made to construct a valve bag sleeve such as described in U.S. Pat. No. 6,164,823 or a self-closing bag such as described in U.S. Pat. No. 6,126,316 to address this problem.

Although some of the sieving problems have been prevented by these various sealing methods, the current sealing mechanisms are not effective in a number of situations or are inapplicable to many mechanical bag-filling systems. Sieving problems are accentuated in the case of filling materials such as rice hull ash.

Harvested paddy rice is subjected to processing operations that remove the rice hulls from the paddy rice. A major use of the separated rice hulls is as a fuel source. Burning rice hulls releases a great deal of energy and renders fine amorphous SiO_2 or black dust particles called rice hull ash. These dust particles are primarily composed of silica and contain considerable air space within its interstices, thereby producing a remarkably insulative material often used to insulate molten steel.

Typically, rice hull ash is packaged, sold and transported in plastic valve bags. To date there has been no successful

mechanism for sealing valve bags containing rice hull ash during their transport. One problem is that once a bag is filled on the fill tube and is removed, the fill tube drags particles of the rice hull ash along with it across the ends of the valve channel contaminating the opposing surfaces, thereby preventing a tight seal when the adhesive on the opposing surfaces is activated. This is a particular problem if the adhesive is to be activated by heat, since the rice hull ash has particularly strong insulative properties.

Thus, there is an existing need to securely seal a valve bag filled with minute particles having insulative properties. Since filling of the valve bag typically contaminates the sides of the valve channel with the particles with which the valve bag is filled, a protection means is needed that will protect the surfaces of the valve channel during the filling of the bag to ensure the secure sealing of the valve channel once the valve bag has been filled and flattened.

SUMMARY OF THE INVENTION

One aspect of the invention provides for a sealing device comprising a sheet of flexible material having a first section and a second section at opposed ends of the sheet, wherein the sheet is sufficiently flexible such that the first section is foldable over the second section; a first adhesive underlying at least one section of the sheet; a second adhesive on an upper surface of at least one section of the sheet; and a removable upper protective sheet covering the second adhesive.

Another aspect of the invention provides for a sealing device comprising two inside sections having a first adhesive coating an inner surface of the inside sections; two outside sections having a second adhesive coating an outer surface of said outer sections; and a removable protective sheet covering the adhesive coating of said outer surface of said outer sections.

Yet another aspect of the invention provides for a valve bag having a tubular body and a valve channel, wherein the improvement includes a sealing device comprising: a sheet of flexible material having a first section and a second section at opposed ends of the sheet, wherein the sheet is sufficiently flexible such that the first section is foldable over the second section; a first adhesive underlying the sheet, such adhesive securing the backside of the first section to an underside of a top side of the valve channel and the backside of the second section to the upper side of the bottom side of the valve channel; a perforated seam located between the first section and the second section of the sheet and substantially centered in the valve channel; a second adhesive overlaying an upper surface of the first and second sections of the sheet; and a removable upper protective sheet covering the second adhesive; whereby when the protective sheet is removed from the second adhesive on the upper surface of the first and second sections, the top side of the first section is folded over the top side of the second section of the sheet and the first and second sections are pressed together such that the valve channel is sealed by the interaction between the second adhesive on the upper surface of the first section with the second adhesive on second section.

The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter, which form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and the specific embodiments disclosed might be readily utilized as

a basis for modifying or designing other structures for carrying out the same purpose of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a side view of a valve bag having a side channel;

FIG. **2** is a pan view of a valve channel;

FIG. **3**A is a front pan view of one embodiment of the sealing device according to the present invention;

FIG. **3**B is a cross sectional view of the outside section of the sealing device shown in FIG. **3**A;

FIG. **4**A is a back pan view of the sealing device shown in FIG. **3**A;

FIG. **4**B is a cross sectional view of the inside section of the sealing device shown in FIG. **4**A;

FIG. **5** is a front view of a sheet of protective material;

FIG. **6** is a front view of another embodiment of a sheet of protective material;

FIG. **7** is a frontal view of another embodiment of the present invention;

FIG. **8** is a cross sectional view of the sealing device shown in FIG. **7**;

FIG. **9** illustrates the placement of the sealing device shown in FIG. **7** in the valve bag;

FIG. **10** is a view of the installation of the sealing device of FIG. **7** over the valve channel;

FIG. **11** illustrates the perforation of the perforated seam of the sealing device shown in FIG. **7**;

FIG. **12** shows the removal of the protective sheet to expose the adhesive layer of the sealing device and the direction that the sealing device is folded over to seal the valve channel;

FIG. **13** FIG. **18** is a pan view of a valve bag with an end valve channel;

FIG. **14** is a cross sectional view of the sealing device shown in FIG. **13**;

FIG. **15** illustrates an alternative placement of the sealing device shown in FIG. **13** on the valve bag;

FIG. **16** is a pan view of the installation of yet another embodiment of the sealing device of the present invention on the valve bag;

FIG. **17** is a cross sectional view of the longer section of the sealing device shown in FIG. **16**.

FIG. **18** is an exploded view of a valve bag;

FIG. **19** is a pan view of the valve bag of FIG. **18** with an end valve channel;

FIG. **20** is a frontal view of the valve channel of the valve bag of FIG. **18** with a sealing device of the present invention installed inside the opening to the valve channel;

FIG. **21** is a longitudinal cross sectional view of the sealing device shown in FIG. **20**;

FIG. **22** is a top view of another embodiment of the sealing device of the present invention;

FIG. **23** is a longitudinal cross sectional view of the sealing device shown in FIG. **22**;

FIG. **24** illustrates the placement of the sealing device shown in FIG. **22** into the valve channel;

FIG. **25** illustrates the sealing of the valve channel of an end valve bag with the sealing device of FIG. **22**;

FIG. **26** is a top view of another embodiment of the sealing device of the present invention; and

FIG. **27** is a longitudinal cross sectional view of the sealing device shown in FIG. **26**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to the manufacture, installation and use of a sealing device for sealing a valve channel of a valve bag; particularly a valve bag filled with minute particles having insulative properties that negate the heat sealing of the valve channel.

Referring now to the drawings, and initially to FIG. **1**, it is emphasized that the Figures, or drawings, are not intended to be to scale. For example, purely for the sake of greater clarity in the drawings, layer thicknesses and spacings are not dimensioned as they actually exist in the assembled embodiments.

A typical valve bag **10** has a tubular configuration with long sides **11** and **12** and short sides **13** and **14** as shown in FIG. **1**. Valve bags are preferably multi-walled, for example having 2 to 4 layers. For simplicity, however, the valve bag **10** is depicted in the Figures as being made from only a single layer of plastic. The valve bag **10** is generally formed by cutting and overlapping a layer of plastic along its length. The overlapping region on the long side of the bag is heat sealed, as well as the short sides **13** and **14**; provided that a portion of one side is left unsealed close to one end of the bag to provide a fill hole or side valve channel **16**.

A side valve channel **16** is shown in more detail in FIG. **2**. The valve channel **16** is defined between the overlapping front flap **22** and the bottom flap **24**. The valve channel **16** is not heat sealed whereas the rest of the seam along the length of the valve bag **10** has been heat sealed along heat seam **26**. The valve channel **16** allows introduction of the product (not shown) that is to be held within the valve bag **10**. The valve channel is disposed close to the short side **13** of the valve bag **10**, but is preferably about 2 to about 6 inches below the intersection of the heat seam **26** and the short side **13**.

An alternative configuration of a valve bag **200** is shown in FIG. **18**. The valve bag **200** is typically made of one or more layers of paper or plastic. Typically the short sides **204** and **203** of the ends of the valve bag **200** are folded towards the center of the valve bag **200**. Then a tubular valve channel **206** is secured to one of the folded short sides such that one end of the valve channel **206** is in communication with the interior of the valve bag **200** and an opposed end of the valve channel **206** is open to the exterior of the valve bag **200**. The long sides **202** and **207** of the ends are then folded over the short sides **204** and **203** and the valve channel **206**. Finally, a top overlay piece **208** is added to secure the ends of the valve bag **200**. Generally the interacting sections of the ends of the valve bag **200** are heat sealed together, except that the interior of the tubular valve channel **206** is left open so that a filling tube can be introduced into the exterior end of the valve channel **206** and introduce product into the interior of the valve bag **200**.

The present invention provides for a means of securely sealing a valve channel **16** or **206** of a valve bag **10** or **200** filled with minute insulative particles. The present invention prevents the contamination of the adhesive on the sides of the valve channel **16** or **206** with the particles filling the valve bag **10** or **200** by protecting at least one adhesive layer

of the sealing device during the filling and flattening of the valve bag **10** or **200**.

One embodiment of the present invention provides a sealing device having two sections separated by a perforated seam. Each section is secured to one side of the valve channel and has an adhesive surface covered by a protective sheet. The two sections are perforated by the filling tube when the filling tube is inserted into the valve bag **10** to fill the valve bag. Once the valve bag **10** is filled and the fill tube removed, the protective sheet, covering the adhesive layer on each section of the sealing device, is cleaned and removed and the two sections of the sealing device are pressed together and secured by the interaction of their adhesive layers.

A preferred embodiment of the valve sealing device of the present invention is designed to fit into existing 6 inch valve channels situated along seam **26** of double walled 3.5-mil thick plastic valve bags. However, the sealing device may be varied in size and shape to fit into various types of valve bags. The sealing device is typically incorporated into the valve channel **16** as the plastic film is being formed into the valve bag **10** as described below, or into the valve channel **206** as it is being formed. Several embodiments of the sealing device of the present invention are described in the illustrative examples below.

EXAMPLE 1

Internal-External Sealing Device

One embodiment of the sealing device of the present invention is illustrated in FIGS. **3**A and **4**A. The sealing device **30**, illustrated in FIG. **3**A, is made from a piece of soft plastic (preferably polypropylene or polyethylene) or paper approximately 7 inches high and 8 inches wide. The plastic or paper piece is folded in half widthwise and the fold is perforated to tear when pushed against by a fill tube. Then each half is folded outward back on itself to the perforated seam **34**. The folded sealing device **30** has two outside sections **36***a* and **36***b* and two inside sections **38***a* and **38***b*.

FIG. **3**A is a frontal view of sealing device **30** as it fits into valve bag **10**, whereas FIG. **4**A is a backside view of the sealing device **30**. The back surface of the two inside sections **38***a* and **38***b* will have an adhesive **42** applied to them as shown in FIGS. **4**A and **4**B. Likewise, the front surface of the two outside sections **36***a* and **36***b* will have an adhesive **44** applied to them as shown in FIGS. **3**A and **3**B. To protect the adhesive before its application to the point of desired contact, removable strips of protective material **39** are placed over the adhesive **44** on the front surface of the outside sections **36***a* and **36***b* as illustrated in FIG. **3**B. Similar removable strips of protective material **49** are optionally placed over the adhesive **42** on the back surface of the two inside sections **38***a* and **38***b* as shown in FIG. **4**B. Preferably, the adhesive **42** is a heat activated adhesive that is activated to adhere to the sides of the valve channel **16** during the heat sealing of the long side of the valve bag **10**. If the adhesive **42** is heat activated, it will not need to be protected with protective material **49**.

When the sealing device is installed into the valve channel **16**, the adhesive **42** of the inside sections **38***a* and **38***b* is contacted with and adhered to the inside surface **28** of the front flap **22** and the top surface of the bottom flap **24** respectively. The adherence of the inside sections to the sides of the valve channel **16** is accomplished by a variety of means known in the art such as glue or a heat activated adhesive.

Once the inside surfaces **38***a* and **38***b* of the sealing device **30** have been adhered to the inside surface **28** of the front flap **22** and the top surface of the bottom flap **24**, the perforated seam **34** is in about the middle of the valve channel **16** and the front surface of the outside sections **36***a* and **36***b* extends beyond front flap **22** and bottom flap **24** respectively. The adhesive **44** on the front surface of the outside sections **36***a* and **36***b* is protected with removable protective strips **39**.

When the sealing device **30** is installed in the valve channel **16** as described above, the outside sections **36***a* and **36***b* will abut each other. The adhesive **44** on the outside sections **36***a* and **36***b* is preferably protected by a single sheet of protective material **52**, shown in FIG. **5**, having a perforated seam **54** in the middle the protective sheet **52**. When the fill tube is pushed through the perforated seam **54** to begin filling the valve bag **10**, the protective sheet **52** will either split into two halves or it will stay adjoined at the lower end **56**. The protective sheet **52** may be designed to remain a single piece at the lower end **56** by extending the protective sheet **52** beyond the length of the valve channel sufficiently to allow the entrance of the fill tube into the valve channel **16** without splitting the bottom of the protective sheet **52**. In addition, the lower end **56** is not perforated to further encourage the protective sheet **52** not to split at its bottom end when the fill tube is pushed into the valve channel **16** and through perforation **34** of the sealing device **30** to begin filling the valve bag **10**.

Another embodiment of the protective sheet **62**, shown in FIG. **6**, will be cut at one end to form two strips of protective material **64***a* and **64***b* at its upper, while the lower end **66** will be a single piece. Thus, the protective sheet **62** will have a Y-like shape with the strips of protective material **64***a* and **64***b* being applied to the outside sections **36***a* and **36***b* respectively. Thus, the protective sheet **62** is removable in one movement by pulling upward on the bottom end **66**.

Once the protective sheet **52** or **62** is removed from the outside sections **36***a* and **36***b*, the outside sections are folded over each other and pressed together to form a consistent secure seal for the valve channel **16**. The width of the outside sections **36***a* and **36***b*, as well as the strips of protective material **64***a* and **64***b*, must be sufficient to ensure enough adhesive covered surface area is available to securely seal the valve channel **16**, even if the outside sections do not exactly align after the valve bag **10** is filled.

Valve bags **10** manufactured with the sealing device **30** in place are easily filled and sealed on the typical assembly line. The valve bags **10** are filled through a filling tube inserted into the valve channel **16**. Once the valve bag **10** is filled, the valve bag **10** is flattened to remove excess air, particles and dust are blown or wiped from the surface of the protective sheet **52** or **62** covering the outside sections **36***a* and **36***b*, the protective sheet **52** or **62** is removed, and the outside sections **36***a* and **36***b* are folded over on top of each other and sealed by pressing down on the adhesive layers. Once sealed, the valve channel **16** will not leak the filling material during handling or transport.

EXAMPLE 2

Overlapping Valve Channel Sealing Device

A second embodiment of the present invention is illustrated in FIG. **7**. The sealing device **70** is made from a piece of soft plastic (preferably polypropylene or polyethylene) or paper approximately 7 to 8 inches high and 4 to 5 inches wide. The plastic or paper piece is folded in half widthwise

and the fold is perforated to tear when pushed against by a fill tube. The perforated seam **72** may or may not extend the entire length of the sealing device **70**, although it will extend at least the length of the valve channel **16**.

A cross-section of sealing device **70** is shown in FIG. **8**. The sealing device **70** comprises a sheet of flexible material **82**, a first adhesive surface layer **89** coating the back side of sheet **82** and a second adhesive surface layer **84** coating the top side of sheet **82**. The adhesive layer **89** on the backside of sealing device **70** is optionally covered with a removable protective covering **87** and the adhesive layer **84** on the frontside of sealing device **70** is covered with a removable protective covering **86**. If the adhesive layer **89** is a heat activated adhesive, it will not need to be protected with protective covering **87**. The adherence of the adhesive layer **89** to the sides of the valve channel **16** is accomplished by a variety of means known in the art such as glue or a heat or sonically activated adhesive.

FIGS. **9** and **10** show sealing device **70** being installed in the valve bag **10**. The sealing device **70** has two sections **92** and **94** separated by a perforated seam **72**. FIG. **10** shows the sealing device **70** where the bottom side of section **92** is applied onto the bottom side of the overlapping front flap **22** and the bottom side of section **94** is applied to the top side of bottom flap **24**. To protect the adhesive layer **84** that is on the upper surface of sections **92** and **94** before its application to the point of desired contact, removable strips of protective covering **86** are placed over the adhesive layer **84**.

The sealing device **70** is installed as the cut plastic film is being formed into the valve bag **10**. As the plastic film is folded over and heat sealed along seam **26**, but before the short sides **13** and **14** are heat sealed, the overlapping front flap **22** and the bottom flap **24** can be separated and laid flat to permit the easy installation of the sealing device **70**. As shown in FIG. **9**, the sealing device **70** is aligned over the valve channel **16** and the bottom side of section **92** is adhered to the bottom side of the overlapping front flap **22** and the bottom side of section **94** is adhered to the top side of bottom flap **24**. After the sealing device **70** has been installed, the overlapping front flap **22** is folded back over the bottom flap **24** and the short sides **13** and **14** of the valve bag **10** are heat sealed, which seals the top and bottom ends of the overlapping front flap **22** to the bottom flap **24**.

When the sealing device **70** is installed in the valve channel **16** as described above, the topsides of section **92** and **94** will be aligned on top of each other. A single sheet of protective covering **86** having a perforated seam **72** in the middle the protective covering **86** protects the adhesive layer **84** on the top surface of sections **92** and **94** as shown in FIGS. **10** and **11**. When the fill tube is pushed through the perforated seam **72** to begin filling the valve bag **10**, the protective covering **86** will either split into two halves or it will stay adjoined at the lower end **76**. Similarly to the protective sheet **52** shown in FIG. **5**, the protective covering **86** may be designed to remain a single piece at the lower end **76** by extending the protective covering **86** beyond the length of the valve channel sufficiently to allow the entrance of the fill tube into the valve channel **16** without splitting the bottom of the protective covering **86**. In addition, the lower end **76** may not be perforated to further encourage the protective covering **86** not to split at its bottom end **76** when the fill tube is pushed into the valve channel **16** to begin filling the valve bag **10**.

Valve bags **10** manufactured with the sealing device **70** in place are easily filled and sealed on the typical assembly line. The valve bags **10** are filled through a filling tube inserted into the valve channel **16**. The valve bag **10** is then flattened to remove excess air. Once the valve bag **10** has been filled and flattened, the top surface of the protective covering **86** is cleaned by blowing a stream of air over it, by brushing dust and particles off of it, or by vacuuming it off. When the protective covering **86** is clean, it is removed as shown in FIG. **12** from the top surface of sections **92** and **94**. The top surface of sections **92** and **94** are then folded over each other and pressed together to form a consistent secure seal for the valve channel **16**. The width of the sections **92** and **94**, as well as the strips of protective covering **86**, must be sufficient to ensure enough adhesive covered surface area is available to securely seal the valve channel **16**, even if the outside sections do not exactly align after the valve bag **10** is filled.

EXAMPLE 3

Fold-over Flap Valve Channel Sealing Devices

Alternative embodiments of the sealing device are shown in FIGS. **13** and **15**. The sealing device **100**, shown in FIG. **13**, is made from a piece of soft plastic (preferably polypropylene or polyethylene) or paper approximately 7 to 8 inches high and 4 to 5 inches wide. The plastic or paper piece is folded widthwise, generally one side **105** is made wider than the other side **102**, and a fold **105** is created. The fold **105** is preferably minimally perforated to assist folding of the sealing device **100**, but to resist tearing of the fold **105** during handling of the sealed valve bag **10**. If the fold **105** is perforated, it is preferably not perforated the entire length of the sealing device **100**.

A cross-section of the side **104** of the sealing device. **100** is shown in FIG. **14**. The side **104** comprises a sheet of flexible material **106**, an adhesive surface layer **108** on the back side of sheet **106** and a removable protective covering **110** on the bottom side of adhesive surface layer **108**.

FIG. **13** is a pan view of sealing device **100**. The sealing device **100** has two sections, a smaller section **102** and a wider section **104**, separated by the seam **105**. The section **102** has an adhesive on its underside. FIG. **13** shows the sealing device **100** where the adhesive layer on the bottom of section **102** is applied onto the valve bag **10** on the side of the valve channel **16** across from the overlapping flap **103** of the valve channel. The adhesive on the backside of section **102** may be heat activated or any other type of adhesive known in the art.

The wider section **104** is wide enough to pass over the overlapping flap **103** and be secured to the valve bag **10** on the opposite side of the overlapping flap **103** from the smaller section **102**. To protect the adhesive layer **108** that is on the under side of the wider section **104** before its application to the point of desired contact, a removable strip of protective covering **110** is placed over the adhesive layer **108**.

The sealing device **100** is installed after the valve bag **10** has been formed. First, the adhesive on the underside of section **102** is adhered to valve bag **10** such that it is aligned with the valve channel **16** and on the opposite side of the valve bag **10** from the overlapping flap **103**.

Once the sealing device **100** is installed on the valve bag, the valve bag **10** is ready for filling. The fill tube is inserted into the valve channel **16** to begin filling the valve bag **10**. Once the valve bag **10** has been filled and flattened, the valve bag channel **16** is closed and the valve bag surface around the valve bag channel is blown, wiped or vacuumed to remove any dust or particulate matter. Once the surfaces

have been cleaned the protective sheet **110** on the bottom side of the section **104** is removed to expose the adhesive layer **108**. The adhesive layer **108** is pressed against the valve bag **10** to secure the section **104** to the valve bag on the opposite side of the valve channel **16** from where the section **102** is attached to the valve bag **10**.

The sealing device **100** can be installed in either direction over the valve channel **16** as shown in FIGS. **13** and **15**. The width of the sections **102** and **104**, as well as the strips of adhesive **108** and protective covering **110**, must be sufficient to ensure enough adhesive covered surface area is available to securely seal the valve channel **16**, even if the outside sections do not exactly align after the valve bag **10** is filled.

Alternatively, another adhesive strip **107**, protected by a protective sheet, may be applied to the opposite side of the valve bag **10** from where the smaller section **102** is applied to the valve bag **10**. The adhesive strip **107** is aligned with valve channel **16**. Once the valve bag is filled and the protective surfaces covering the inner adhesive **108** of section **104** and the adhesive strips **107** are cleaned, the protective sheets are removed, as shown in FIG. **15**, and the adhesive layer **108** is folded over the closed valve channel **16** and adhered to the adhesive strip **107** to securely seal the valve channel.

EXAMPLE 4

Top-Bottom Fold-Over Sealing Devices

Another embodiment of the sealing device is shown in FIG. **16**. The sealing device **140** is typically much longer than the other embodiments of the sealing device described above. Sealing device **140** is very similar in construction to the sealing device **100**. The sealing device **140** is a single long piece that has a fold dividing sealing device **140** into two sections, a smaller section **142** and a longer section **144**. The smaller section **142** has an adhesive on its underside, but may or may not be covered by a protective sheet; whereas the longer section **144** will have a protective sheet covering its adhesive layer. A cross-section of the longer section **144** is shown in FIG. **17**, the section **144** comprises a plastic or paper sheet **146**, an adhesive layer **148** and a protective covering **149**.

The smaller section **142** is attached to the valve bag **10** below the valve channel **16** by adhering it to the valve bag **10** before the valve bag **10** is filled. Once the valve bag **10** is filled and flattened, the valve channel **16** is folded closed, the surface of the valve bag **10** around the valve channel **16** is cleaned of dust and debris, the longer section **144** of the sealing device **140** is folded over the length of the valve channel, its protective covering **149** removed and the adhesive layer **148** on the under side of the longer section **144** is secured along the surface of the closed valve channel to ensure that it is securely closed. As with the sealing device **100**, an alternative adhesive strip **145** may be used to further ensure a consistent secure seal on the valve channel **16**.

EXAMPLE 5

Sealing Device for Sealing End Valve Tube

FIGS. **18** and **19** show a typical valve bag **200** having an end valve channel or tube **206**. During assembly of the valve bag **200**, the short end pieces **204** and **203** are folded inward and the bottom side of the valve tube **206** is placed on top of the end piece **204**. The long end pieces **202** and **207** are then folded over the short end pieces **204** and **203** and the valve tube **206** as illustrated in FIGS. **18** and **19**. The folded end pieces and valve tube **206** are held in place by the overlay **208**. One end of the valve tube **206** is open to the interior of the valve bag **200** and the other end is open to the exterior of the bag so that a fill tube can be inserted to fill the bag.

One embodiment of the sealing device **205**, shown in FIG. **20**, is constructed similar to sealing device **70**, except that it is preferably annular in construction to fit snuggly within the valve tube **206**.

The sealing device **205** is made from a piece of soft plastic (preferably polypropylene or polyethylene) or paper that is folded in half lengthwise and the fold is perforated to tear when pushed against by a fill tube. A cross-section of sealing device **205** is shown in FIG. **21**. The sealing device **205** comprises a soft plastic or paper sheet **282**, an adhesive surface layer **289** on the back side of sheet **282** and an adhesive surface layer **284** on the top side of sheet **282**. The adhesive layer **289** on the backside of sealing device **205** is optionally covered with a removable protective covering **287** and the adhesive layer **284** on the frontside of sealing device **205** is covered with a removable protective covering **286**. If the adhesive layer **289** is a heat activated adhesive, it will not need to be protected with protective covering **287**. The adherence of the adhesive layer **289** to the sides of the valve tube **206** is accomplished by a variety of means known in the art such as glue or a heat or sonically activated adhesive.

FIG. **20** shows sealing device **205** installed in the valve tube **206** of valve bag **200**. The sealing device **205** has two sections **292** and **294** separated by a perforated seam **272**. FIG. **20** shows the sealing device **205** where the bottom side of section **292** is applied along the surface of the top side of the valve tube **206** and the bottom side of section **294** is applied along the surface of the bottom side of the valve tube **206**. To protect the adhesive layer **284** that is on the upper surface of sections **292** and **294** before its application to the point of desired contact, a removable protective covering **286** are placed over the adhesive layer **284**.

The sealing device **205** is installed before the valve bag **200** is filled. Once the sealing device **205** is installed in the valve tube **206**, the topsides of section **292** and **294** will be aligned on top of each other. A single sheet of protective covering **286** having a perforated seam **272** in the middle the protective covering **286** protects the adhesive layer **284** on the top surface of sections **292** and **294**. When the fill tube is pushed through the perforated seam **272** to begin filling the valve bag **200**, the protective covering **286** will basically split into two halves. Similarly to the protective sheet **52** shown in FIG. **5**, the protective covering **286** may be designed to remain a single piece at its lower end by extending the protective covering **286** beyond the length of the valve tube **206** so that it can be more easily removed.

Alternatively the sealing device may be constructed of two sections of material, each section similar the section **292** of the sealing device **205**. In this embodiment the two sections of the sealing device may be separate pieces or may be constructed as a single piece **300** such as shown in FIG. **27** in which a central section **310** separates two end sections **302** and **304**. A cross-section of sealing device **300** is shown in FIG. **28**. The sealing device **300** comprises a soft plastic or paper sheet **320** with an adhesive layer **315** on its underside. The adhesive layer **315** may or may not be covered with a protective sheet. The topside of the layer **320**, corresponding to the two end sections **302** and **304**, has adhesive layers **316** and **318** respectively. These two adhesive layers **302** and **304** are covered with protective sheets **322** and **324** respectively.

The sealing device **300** is installed into the valve tube **206** as it is being made. The sealing device is secured by adhesive to the inner surface of the valve tube **206** while it is a linear sheet before it is rolled into a tube. The sealing device **300** is secured to the valve tube **206** such that when the valve tube **206** is in a tubular configuration the end sections **302** and **304** are aligned so that one is on top of the other. The protective sheets **322** and **324** may be extended in length to ease their removal after the valve bag has been filled.

Valve bags **200** with the sealing device **205** or **300** in place are easily filled and sealed on the typical assembly line. The valve bags **200** are filled through a filling tube inserted into the valve tube **206**. Once the valve bag **200** has been filled, the top surface of the protective coverings **286** or **322** and **324** are cleaned by blowing a stream of air over them, by brushing dust and particles off of them, or by vacuuming them off. When the protective coverings **286** or **322** and **324** are clean, they are removed from the top surface of sections **292** and **294** or **302** and **304**. The top surface of sections **292** and **294** or **302** and **304** are then folded over each other and pressed together to form a consistent secure seal for the valve tube **206**. The width of the sections **292** and **294** or **302** and **304**, as well as the strips of protective coverings **286** or **322** and **324**, must be sufficient to ensure enough clean adhesive covered surface area is available to securely seal the valve tube **206**, even if sections **292** and **294** or **302** and **304** do not exactly align after the valve bag **200** is filled.

EXAMPLE 6

Fold Over Valve Tube Sealing Device

Another embodiment of sealing device **250** is designed to seal the valve tube **206**. The sealing device **250**, shown in FIG. **22** is made from a piece of soft plastic (preferably polypropylene or polyethylene) or paper.

A cross-section of sealing device **250** is shown in FIG. **23**. The sealing device **250** comprises a soft plastic or paper layer **210**, an adhesive layer **212** on a portion of one end of the back side of layer **210** and an optional removable protective covering **214** on the bottom side of adhesive surface layer **212**. The portion of the layer **210** that is directly above the adhesive layer **212** has a smooth non-adhesive surface. At the opposite end of layer **210**, an adhesive layer **216** covers a portion of the top side of layer **210** and a protective sheet **218** covers the adhesive layer **216**. The adhesive layers **216** and **214** cover opposite ends of the layer **210** on opposed sides. Generally, the adhesive layers **216** and **214** will not cover the same section of the layer **210** and there may be a section of the layer **210** where no adhesive is applied to the top surface or the bottom surface of the layer **210** as illustrated in FIG. **23**.

The sealing device **250** is generally installed after the valve bag **200** has been made as shown in FIGS. **24** and **25**. The adhesive layer **212** on the bottom side of the layer **210** is applied to the interior lower surface of the valve channel **206** to securely attach the sealing device to the valve channel **206**. Once the valve bag **200** has been filled, the protective sheet **218** is removed to expose the adhesive layer **216**. Then the sealing device **250** is folded over the overlay piece **208** and adhered to upper side of the overlay **208** to securely close the end of the valve channel **206** that opens to the outside. A partial cross-section of the upper end of valve bag **200** securely closed with sealing device **250** is shown in FIG. **26**.

Alternatively, another adhesive strip, protected by a protective sheet, may be applied to the end of the upper side of the overlay **208** where the sealing device **250** is folded over. The adhesive strip is aligned with valve channel **206**. Once the valve bag is filled and the protective surfaces covering the adhesive covering the overlay **208** and the adhesive layer **216** of the sealing device **250** are removed, the adhesive layer **216** is folded over the closed valve channel **206** and adhered to the adhesive strip covering that end of the overlay **108** to securely seal the valve channel.

The sealing device **250** may also be made a part of the valve bag **200**. In that case, the end of sealing device **250** opposite the adhesive layer **216** would be heat sealed or otherwise secured between the side **204** and the bottom outside surface of the valve channel **206**. The end of the sealing device **250** having the adhesive layer **216** and the protective sheet **218** would extend outward from the valve bag **200**. Once the bag had been filled and flattened, the outwardly extending end of the sealing device **250** would be folded over the overlay **208**, the protective sheet **218** removed, and the adhesive layer **216** secured to the upper side of the overlay **208**.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions, and alterations can be made to the described process, the materials used and the sealing system without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A valve channel seal, in combination with a valve bag comprising a valve bag having a valve channel at a seam of the bag:

a sheet of flexible material having a first section and a second section having a perforated seam located between the first and second section, wherein the first section having a back surface by which it is secured to the first side of the valve channel of the valve bag and the second section having a back surface by which it is secured to a second side of the valve channel and the perforated seam is positioned over an opening in the valve channel;

an second adhesive covering the entire length of an upper surface of at least one section of the sheet; and

a removable upper protective sheet covering the adhesive.

2. The valve channel seal combination of claim **1**, wherein a portion of the protective sheet is perforated.

3. The valve channel seal of combination claim **1**, wherein the adhesive overlies the length of the first and second sections.

4. The valve channel seal combination of claim **1**, wherein the first section has a width substantially similar to a width of the first side of the valve channel.

5. The valve channel seal combination of claim **1**, wherein the first and second sections are substantially equal in surface area.

6. The valve channel seal combination of claim **1**, wherein the sealing device is rectangular in shape.

7. The valve channel seal combination of claim **1**, wherein the first section is adjacent the second section.

8. The valve channel seal combination of claim **1**, wherein the sheet further comprises a third section located between the first and second section.

9. The valve channel seal combination of claim **1**, wherein the first section is larger than the second section.

10. A valve channel seal in combination with a valve bag comprising a valve bag having a valve channel at a seam of the bage:

a sheet of flexible material having a first section and a second section having a perforated seam located

between the first and second section, wherein a first under surface of the first section is secured to a first side of the valve channel of the valve bag and a second under surface of the second section is secured to a second side of the valve channel and the perforated seam is positioned over an opening in the valve channel, the sheet is folded over itself at the perforated seam such that a first upper surface of the first section faces a second upper surface of the second section;

an adhesive covering the entire length of the first and second upper surface of the first and second section of the sheet; and

a removable upper protective sheet covering the adhesive.

11. A valve channel seal in combination with a valve bag comprising (a) a valve bag having a vale channel at a seam of the bag:

(b) a four sectioned sheet of flexible material having a proximal end and a distal end, the sheet comprising

(i) a primary exterior section having a first side and a second side, wherein the first side of the primary exterior section is the distal end of the four sectioned sheet,

(ii) a secondary exterior section having a first side and a second side, wherein the second side of the secondary exterior section in proximal end of the four sectioned sheet,

(iii) a primary interior section having a first side and a second side, wherein the second side of the primary interior section adjoins the second side of the primary exterior section, and

(iv) a secondary interior section having a afirst side and a second side, wherein the first side of the secondary interior section adjoins the first side of secondary exterior section and the second side of the secondary interior section is joined to the first side of the primary interior section, wherein the primary and secondary interior sections are folded inward and the second side of the primary exterior section is aligned with the first side of the secondary exterior section;

(c) a first adhesive coating the entire length of a back surface of the primary and secondary interior sections, such that when the primary and secondary sections are folded inward a front surface of the primary interior section faces a front surface of the secondary interior section and the first adhesive coating of the primary interior section and the first adhesive coating of the secondary interior section face away from each other;

(d) the primary and secondary interior sections are, respectively, adhered to a first side and a second side of the valve channel of the valve bag;

(e) a second adhesive coating the entire length of an outer surface of the primary and secondary exterior sections; and

(f) a removable upper protective sheet covering the second adhesive coating on the outer surface of the primary and secondary exterior sections, wherein placement of the protective sheet secures the second side of the primary exterior section adjacent to the first side of the secondary exterior section.

12. The valve channel seal combination of claim **11**, wherein a portion of the upper protective sheet is perforated.

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